CHAPTER 5
WATER HEATERS

Part I

501.0 General.
501.1 Applicability. The regulations of this chapter shall govern the construction, location, and installation of fuel-burning instantaneous and other water heaters heating potable water. The minimum capacity for water heaters shall be in accordance with the first hour rating listed in Table 5-1. Design, construction, and workmanship shall be in accordance with accepted engineering practices, manufacturer’s installation instructions, and applicable standards and shall be of such character as to secure the results sought to be obtained by this code. No water heater shall be hereinafter installed that does not comply with the type and model of each size thereof approved by the State Plumbing Board. A list of accepted gas appliance standards are included in Table 14-1.

502.0 Definitions.
502.1 Direct-Vent Water Heaters. Water heaters that are constructed and installed so that air for combustion is derived directly from the outside atmosphere and all flue gases are discharged to the outside atmosphere. [NFPA 54:3.3.6.3]
502.2 Hot Water Supply Boiler. A storage type potable water heating unit exceeding any of the parameters of Section 502.3. A Hot Water Supply Boiler is under the jurisdiction of the Oregon Boiler and Pressure Vessel Specialty Code.
502.3 Storage type water heaters regulated by this code are appliances which heat potable water and are equipped with approved safety devices and operate at or below the following:
   (1) Volume of 120 gallons (454 L);
   (2) Water temperature of 210°F (99°C);
   (3) One hundred fifty pounds-force per square inch (psi) (1034 kPa) operating pressure; and
   (4) Two hundred thousand British Thermal Units (BTU) (58.6 kW•h) input.
502.4 Indirect-Fired Water Heater. A water heater consisting of a storage tank equipped with an internal or external heat exchanger used to transfer heat from an external source to heat potable water. The storage tank either contains heated potable water or water supplied from an external source, such as a boiler.
502.5 Water Heater. An appliance for supplying hot water for domestic or commercial purposes. [NFPA 54:3.3.55.7]
502.6 Instantaneous-Tankless Water Heater. Potable water heating units, sometimes with a small buffer tank, designed to create hot water instantaneously on demand without the use of a storage tank, regardless of size or BTU input, and shall be listed per Table 14-1.

503.0 Permits.
503.1 General. It shall be unlawful for any person to install, remove, or replace or cause to be installed, removed, or replaced a water heater without first obtaining a permit from the building official to do so.

504.0 Inspection.
504.1 Final Water Heater Inspection. This inspection shall be made after work authorized by the permit has been installed. The building official will make such inspection as deemed necessary to be assured that the work has been installed in accordance with the intent of this code. No appliance or part thereof shall be covered or concealed until the same has been inspected and approved by the building official.

505.0 Water Heater Requirements.
505.1 Location. Water heater installations in bedrooms and bathrooms shall be in accordance with one of the following [NFPA 54:10.28.1]:
   (1) Fuel-burning water heaters may be installed in a closet located in the bedroom or bathroom provided the closet is equipped with a listed, gasketed door assembly and a listed self-closing device. The self-closing door assembly shall meet the requirements of Section 505.1.1. The door assembly shall be installed with a threshold and bottom door seal and shall meet the requirements of Section 505.1.2. Combustion air for such installations shall be obtained from the outdoors. The closet shall be for the exclusive use of the water heater.

<table>
<thead>
<tr>
<th>TABLE 5-1</th>
<th>FIRST HOUR RATING¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Bathrooms</td>
<td>1 to 1.5</td>
</tr>
<tr>
<td>Number of Bedrooms</td>
<td>1</td>
</tr>
<tr>
<td>First Hour Rating,² Gallons</td>
<td>42</td>
</tr>
</tbody>
</table>

For SI units: 1 gallon = 3.785 L

Notes:
¹ The first hour rating is found on the “Energy Guide” label.
² Solar water heaters shall be sized to meet the appropriate first hour rating as shown in the table.
Water heater shall be of the direct vent type. [NFPA 54:10.28.1(2)]

**505.1.1 Self-Closing Doors.** Self-closing doors shall swing easily and freely and shall be equipped with a self-closing device to cause the door to close and latch each time it is opened. The closing mechanism shall not have a hold-open feature. [NFPA 80:6.1.4.2]

**505.1.2 Gasketing.** Gasketing on gasketed doors or frames shall be furnished in accordance with the published listings of the door, frame, or gasketing material manufacturer. [NFPA 80:6.4.8]

*Exception:* Where acceptable to the building official, gasketing of non-combustible or limited-combustible material (see NFPA 220) shall be permitted to be applied to the frame, provided closing and latching of the door are not inhibited.

**505.2 Vent.** Water heaters of other than the direct-vent type shall be located as close as practical to the chimney or gas vent. [NFPA 54:9.28.1.2]

**505.3 Clearance.**

**505.3.1 Listed Water Heaters.** The clearances shall not be such as to interfere with combustion air, draft hood clearance and relief, and accessibility for servicing. Listed water heaters shall be installed in accordance with their listings and the manufacturer’s instructions. [NFPA 54:10.28.2.1]

**505.3.2 Unlisted Water Heaters.** Unlisted water heaters shall be installed with a clearance of 12 inches (305 mm) on all sides and rear. Combustible floors under unlisted water heaters shall be protected in an approved manner. [NFPA 54:10.28.2.2]

**505.4 Pressure-Limiting Devices.** A water heater installation shall be provided with overpressure protection by means of an approved, listed device installed in accordance with the terms of its listing and the manufacturer’s installation instructions. [NFPA 54:10.28.3]

**505.5 Temperature-Limiting Devices.** A water heater installation or a hot water storage vessel installation shall be provided with over temperature protection by means of an approved, listed device installed in accordance with the terms of its listing and the manufacturer's installation instructions. [NFPA 54:10.28.4]

**505.6 Temperature, Pressure, and Vacuum Relief Devices.** The installation of temperature, pressure, and vacuum relief devices or combinations thereof, shall be installed in accordance with the terms of their listings and the manufacturer’s installation instructions. A shutoff valve shall not be placed between the relief valve and the water heater or on discharge pipes between such valves and the atmosphere. The hourly British thermal units (Btu) (kW-h) discharge capacity or the rated steam relief capacity of the device shall be not less than the input rating of the water heater. [NFPA 54:10.28.5]

**506.0 Oil-Burning and Other Water Heaters.** Water heaters deriving heat from fuels or types of energy other than gas shall be constructed and installed in accordance with approved standards. Vents or chimneys for such appliances shall be approved types. An adequate supply of air for combustion and for adequate ventilation of heater rooms or compartments shall be provided. Each such appliance shall be installed in a location approved by the building official and local and state fire-prevention agencies.

**506.1 Safety Devices.** Storage-type water heaters and hot water boilers deriving heat from fuels or types of energy other than gas, shall be provided with, in addition to the primary temperature controls, an over temperature safety protection device constructed, listed, and installed in accordance with nationally recognized applicable standards for such devices and a combination temperature and pressure-relief valve.

**506.2 Indirect-Fired Water Heaters.** Indirect-fired water heaters shall comply with the applicable sections of the ASME Boiler and Pressure Vessel Code, or to one of the other applicable standards shown in Table 14-1. Each water heater shall bear a label in accordance with ASME requirements, or an approved testing agency, certifying and attesting that such an appliance has been tested, inspected and meets the requirements of the applicable standards or code.

**506.2.1 Single-Wall Heat Exchanger.** Indirect-fired water heater that incorporate a single-wall heat exchanger shall meet the following requirements:

1. Connected to a low-pressure hot water boiler limited to a maximum of 30 pounds-force per square inch gauge (psig) (207 kPa) by an approved safety or relief valve.

2. Heater transfer medium is either potable water or contains fluids having a toxicity rating or Class of 1.

3. Bear a label with the word “Caution,” followed by the following statements:

   a. The heat-transfer medium shall be water or other nontoxic fluid having a toxic rating or Class of 1 as listed in Clinical Toxicology of Commercial Products, 5th edition.

   b. The pressure of the heat-transfer medium shall be limited to a maximum of 30 psig (207 kPa) by an approved safety or relief valve.

*Note:* The word “Caution” and the statements in letters having an uppercase height of not less than 0.120 of an inch (3.048 mm). The vertical spacing between lines of type shall be not less than 0.046 of an inch (1.168 mm). Lowercase letters shall be compatible with the uppercase letter size specification.

*Exception:* Solar water heaters with single-walled heat exchangers using non-toxic heat transfer fluids may have relief valves set at not more than One hundred fifty pounds-force per square inch (psi) (1034 kPa).

**507.0 Other Water Heater Installation Requirements.** The building official shall have the authority to require the use of an approved dielectric insulator on the water piping connections of water heaters and related water heating appliances.

**507.1 Seismic Provisions.** In seismic design categories C, D, E, and F, water heaters shall be anchored or strapped to
resist horizontal displacement due to earthquake motion. Strapping shall be at points within the upper one-third and lower one-third of its vertical dimensions. At the lower point, a distance of not less than 4 inches (102 mm) shall be maintained from the controls with the strapping.

507.2 Ground Support. A water heater supported from the ground shall rest on level concrete or other approved base extending not less than 3 inches (76 mm) above the adjoining ground level.

**Exception:** Water heaters in residential structures in seismic design category C are not required to be strapped or anchored to resist horizontal displacement due to earthquake motion.

507.3 Drainage Pan. Where a water heater is located in an attic, or any wood framed assembly, a watertight pan of corrosion-resistant materials shall be installed beneath the water heater with not less than 1/4 of an inch (20 mm) diameter drain to an approved location.

**Exceptions:**

1. Replacement of an existing water heater shall not require a water heater pan or drain unless one already exists.
2. Instantaneous water heaters.

507.4 Flammable Vapors. Gas appliances shall not be installed in areas where the open use, handling, or dispensing of flammable liquids occurs, unless the design, operation, or installation reduces the potential of ignition of the flammable vapors. Water heaters installed in accordance with Section 507.5, Secton 507.6, or Section 507.7 shall be considered to be in accordance with the intent of this provision. [NFPA 54:9.1.10.1]

507.5 Installation in Residential Garages.

1. Fuel gas water heaters in residential garages and in adjacent spaces that open to the garage and are not part of the living space of a dwelling unit shall be installed so that burners and burner-ignition devices are located not less than 18 inches (457 mm) above the floor unless listed as flammable vapor ignition resistant. [NFPA 54:9.1.10.1]
2. Such appliances shall be located or protected so it is not subject to physical damage by a moving vehicle in compliance with the Oregon Mechanical Specialty Code, Section M1307.3.1.
3. Where such appliances are installed in a separate enclosed space having access only from outside of the garage, such appliances shall be permitted to be installed at floor level, providing the required combustion air is taken from the exterior of the garage. [NFPA 54:9.1.10.3]
4. Electric water heaters installed in garages may be installed at floor level.

507.6 Installation in Commercial Garages.

507.6.1 Parking Structures. Fuel gas water heaters installed in enclosed, basement, and underground parking structures shall be installed in accordance with the Oregon Mechanical Specialty Code, Section C305.5.

507.6.2 Repair Garages. Fuel gas water heaters installed in repair garages shall be installed in accordance with the provisions of the Oregon Mechanical Specialty Code, Section C305.5.

507.7 Installation in Aircraft Hangars. Heaters in aircraft hangars shall be installed in accordance with NFPA 409. [NFPA 54:9.1.12]

507.8 Fuel Gas Water Heaters Physical Protection. Where it is necessary to locate gas utilization appliances close to a passageway traveled by vehicles. Protection shall be provided in accordance with the Oregon Mechanical Specialty Code, Section C305.

507.9 Combination of Appliances. A combination of fuel gas water heaters, attachments, or devices used together in any manner shall be in accordance with the standards that apply to the individual appliance. [NFPA 54:9.1.21]

507.10 Installation Instructions. The installing agency shall comply with the appliance manufacturer's recommendations in completing an installation. The installing agency shall leave the manufacturer's installation, operating, and maintenance instructions in a location on the premises where they will be readily available for reference and guidance for the building official, service personnel, and the owner or operator. [NFPA 54:9.1.22]

508.0 Access to Appliances on Roofs. Water heaters located on roofs or other elevated locations shall be accessible. [NFPA 54:9.4.3.1]

508.1 Access. Buildings exceeding 15 feet (4572 mm) in height shall have an inside means of access to the roof, unless other means acceptable to the building official are used. [NFPA 54:9.4.3.2]

508.2 Access Type. The inside means of access shall be a permanent, or fold-away inside stairway or ladder, terminating in an enclosure, scuttle, or trap door. Such scuttles or trap doors shall be not less than 22 inches by 24 inches (559 mm by 610 mm) in size, shall open easily and safely under all conditions, especially snow; and shall be constructed so as to permit access from the roof side unless deliberately locked on the inside.

An attic in which an appliance is located on roofs or other elevated locations shall be accessible. [NFPA 54:9.4.3.1]

Not less than 6 feet (1829 mm) of clearance shall be between the access opening and the edge of the roof or similar hazard, or rigidly fixed rails or guards not less than 42 inches (1067 mm) in height shall be provided on the exposed side. Where parapets or other building structures are utilized in lieu of guards or rails, they shall be not less than 42 inches (1067 mm) in height. [NFPA 54:9.4.3.3]

508.3 Permanent Lighting. Permanent lighting shall be provided at the roof access. The switch for such lighting shall be located inside the building near the access means leading to the roof. [NFPA 54:9.4.3.4]

508.4 Appliances in Attics.

508.4.1 Attic Access. An attic in which an appliance is installed shall be accessible through an opening and passageway not less than as large as the largest component of the appliance, and not less than 22 inches by 30 inches (559 mm by 762 mm). [NFPA 54:9.5.1]

508.4.2 Length of Passageway. Where the height of the passageway is less than 6 feet (1829 mm), the distance from the passageway access to the appliance shall not exceed 20 feet (6096 mm) measured along the centerline of the passageway. [NFPA 54:9.5.1.1]
508.4.3 Width of Passageway. The passageway shall be unobstructed and shall have solid flooring not less than 24 inches (610 mm) wide from the entrance opening to the appliance. [NFPA 54:9.5.1.2]

508.4.4 Work Platform. A level working platform not less than 30 inches (762 mm) by 30 inches (762 mm) shall be provided in front of the service side of the appliance. [NFPA 54:9.5.2]

508.4.5 Lighting and Convenience Outlet. A permanent 120-volt receptacle outlet and a lighting fixture shall be installed near the appliance. The switch controlling the lighting fixture shall be located at the entrance to the passageway. [NFPA 54:9.5.3]